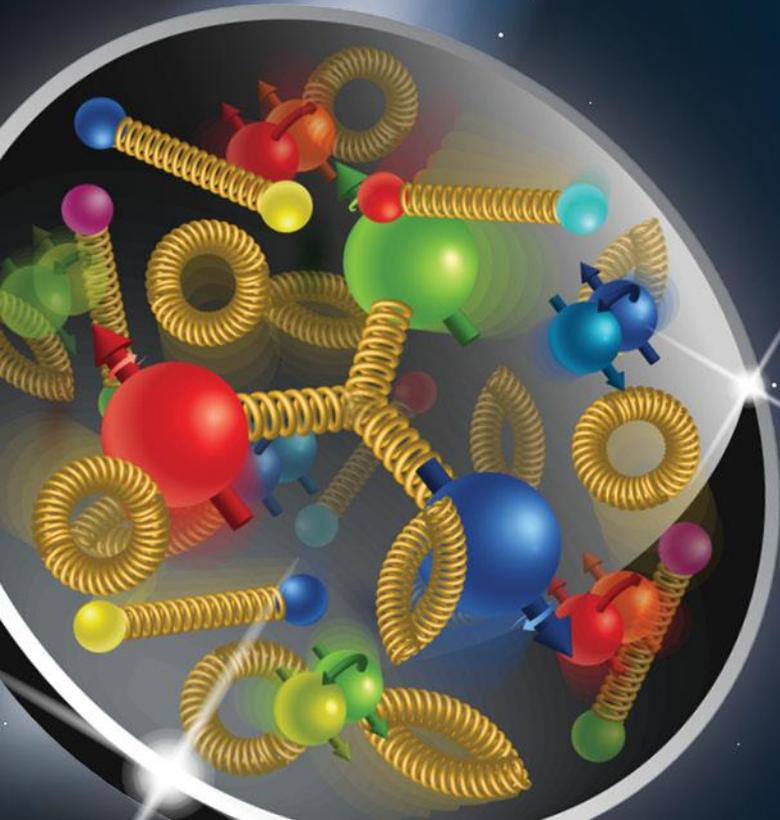


# Infrastructure Overview

Charles Folz, Division Director,  
Infrastructure  
Community Advisory Council

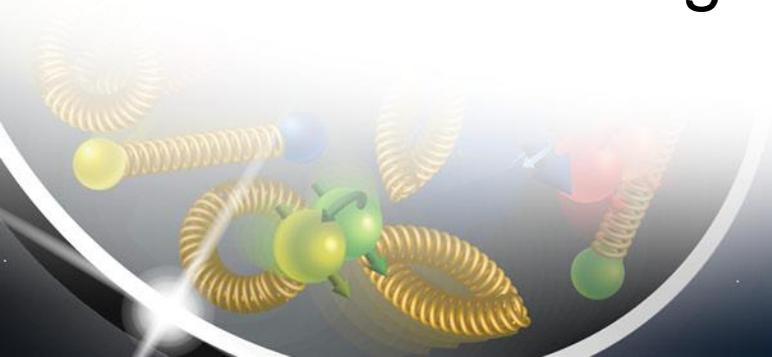
May 13, 2021



Electron-Ion Collider

# Overview:

- About me
  - Who I am
  - Where I'm from
  - How I came to be involved with EIC
- Facilities Support for Science
- EIC Facilities – Design background
- EIC Facilities - Construction
- In closing



# A bit about me...

- Born and raised on Long Island
- Graduate of the US Merchant Marine Academy at Kings Point



- Deep Sea commercial shipping experience – USCG Licensed Chief Engineer



# Continued....

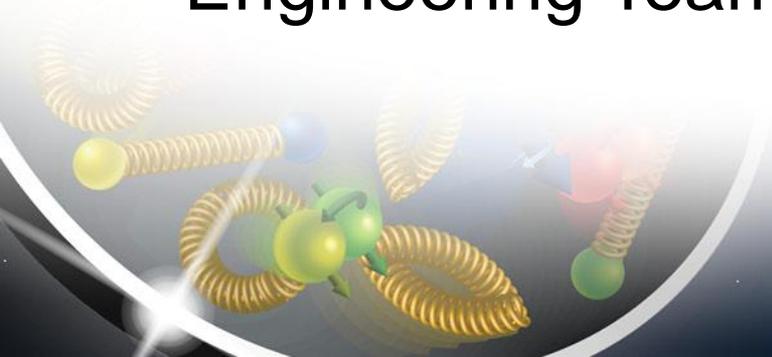
- NYS Licensed Professional Engineer
- Prior to BNL, was in powerplant operations at NYPA's Poletti Project in Astoria, NY



- Came to BNL in 2009 in Collider Accelerator Experimental Support and Facilities
- Worked on evolution of EIC Conceptual Design and now serving as part of the Project Team

# Safety as a Priority

- Building and Site Construction Hazards are mitigated with conventional safety protocols:
  - Excavation – Digging Permits
  - Fall Protection/Prevention, Heavy Equipment, noise, dust, etc. – Job and Work Planning, toolbox meetings, Phased Hazard Analysis, OSHA Training Requirements, IH Monitoring
- Preliminary Fire Hazard Analysis has been completed by the BNL Fire Protection Engineering Team



# From Manhattan Project to EIC: Construction Supporting Science

- The Manhattan Project required construction of large facilities to accomplish the mission; now eight of these are designated signature facilities and are part of the National Parks System.
- This launched the "Atoms for Peace" program ultimately resulting in BNL's role as the Birthplace of Nuclear Medicine.
- DOE and its predecessor agencies have a strong history of successfully executing large complex construction projects in support of the science mission.
- Here at BNL we carry on that tradition:
  - Brookhaven Graphite Research Reactor
  - Cosmotron/AGS
  - RHIC
  - NSLS-II

# Requirements

- Requirements for Infrastructure are driven by the needs of the EIC machine, namely:
  - Space – square or cubic footage
  - Power – Electrical distribution as delivered voltage, amperage capacity and total power available
  - Environmental Conditions – temperature, humidity, stability
  - Cooling capacity – water or air total heat removal over time and water or air quality
- Regulatory Compliance with Codes of Record & DOE Standards, and
- Integration of Systems, Structures and Components (SSCs) into the existing complex

ASTM International - [D1193-06\(2018\)](#)

Standard Specification for Reagent Water

ASTM D1193-06	TYPE 1	TYPE 2	TYPE 3	TYPE 4
Conductivity, min. $\mu\text{S}/\text{cm}$ (25oC)	0.056	1	0.25	5
Resistivity, min. $\text{M}\Omega\text{-cm}$ (25oC)	18	1	4	0.2
TOC, max. $\mu\text{g}/\text{l}$	50	50	200	No limit
Sodium, max. $\mu\text{g}/\text{l}$	1	5	10	50
Silica, max. $\mu\text{g}/\text{l}$	3	3	500	No limit
Chloride, max. $\mu\text{g}/\text{l}$	1	5	10	50
pH value (25oC)	–	–	–	5.0–8.0

ASTM Sub-Standards	A	B	C
Bacteria, max (CFU/ml)	1	10	1,000
Endotoxin, max (EU/ml)	0.03	0.25	–

# Requirements define the design and drive the costs...



"Is it too late to add four floors?"

# Sustainable Design:

- Document High Performance & Sustainable Bldg. & Sustainable Env. Stewardship Considerations

This goal is incorporated into the Statement of Work contract language for the A/E firm working with us on the Infrastructure Design:

## 2.2 Guiding Principles for Sustainable Design

The EIC buildings shall be designed in conformance with Executive Order 13834, Efficient Federal Operations and the Guiding Principles for Sustainable Federal Buildings as updated by the Council on Environmental Quality dated February 26, 2016.

*Note: this document has been updated as of December 2020:*

*[https://www.sustainability.gov/pdfs/guiding\\_principles\\_for\\_sustainable\\_federal\\_buildings.pdf](https://www.sustainability.gov/pdfs/guiding_principles_for_sustainable_federal_buildings.pdf)*

This has been included in the Basis of Design Document in Section 4.0, "Sustainable Design" including a checklist with status – serving to keep this on track:

Guiding Principles Summary			
	% of Guidelines	#	Status
	47%	11	Yes, Meets Guidelines
	9%	2	Yes - Partially Compliant (Y-P)
	26%	6	Not Yet Evaluated (N/E)
	18%	4	Not Applicable (N/A)

This Checklist is based on HDR's analysis of the Guiding Principles requirements given the current proposed design and information provided by the owner. HDR will perform its services with the degree of skill and care normally exercised by similarly situated members of the profession performing similar services at the same time and in the same locale as the Project. Requirements may move from Yes to No to N/A throughout the design and construction process.

# Six Guiding Principles:

The Guiding Principles ensure Federal buildings:

1. Employ Integrated Design Principles  
Integrated design & management, commissioning
2. Optimize Energy Performance  
Efficiency, benchmarking
  - Applicability
3. Protect and Conserve Water  
Indoor, outdoor use
  - Assessment Pathways
  - Operational Impacts
4. Enhance the Indoor Environment  
Indoor air quality (IAQ) strategies
5. Reduce the Environmental Impact of Materials  
Recycled content, solid waste management
6. Assess and Consider Building Resilience  
Effects of climate change

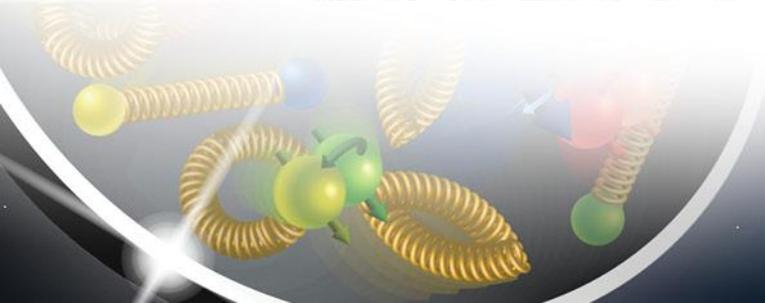
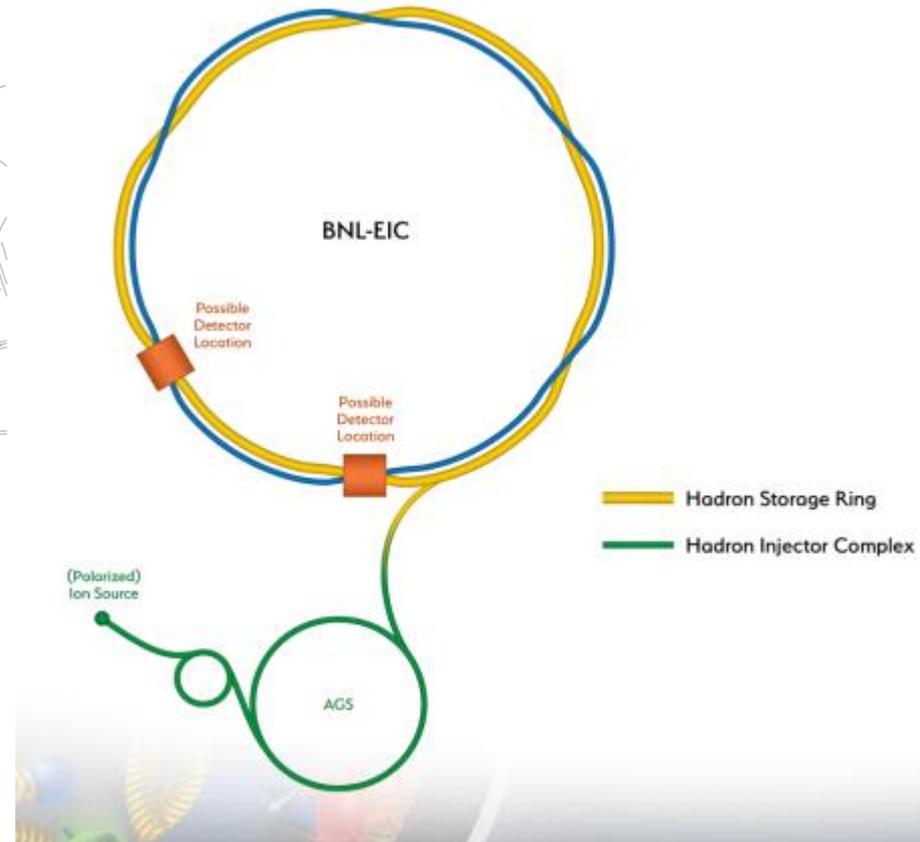
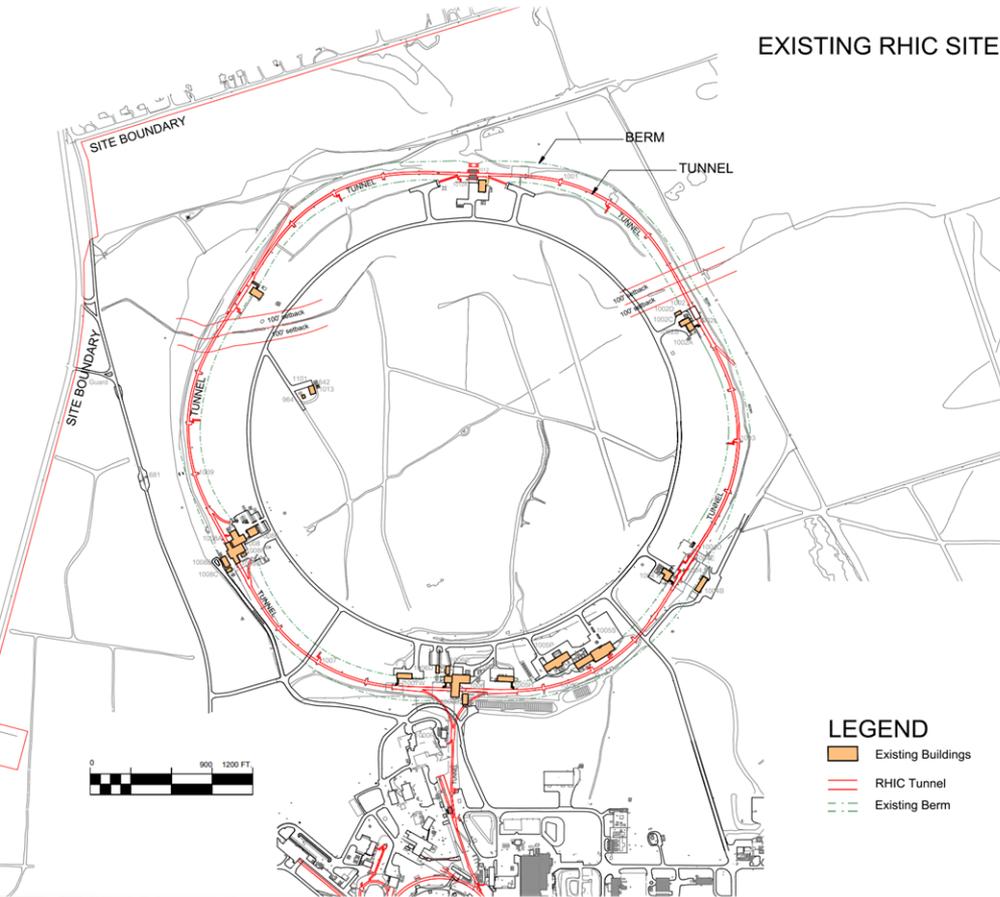
# BROOKHAVEN NATIONAL LABORATORY ELECTRON ION COLLIDER



Video courtesy HDR, our CDR A/E Firm Design Partners

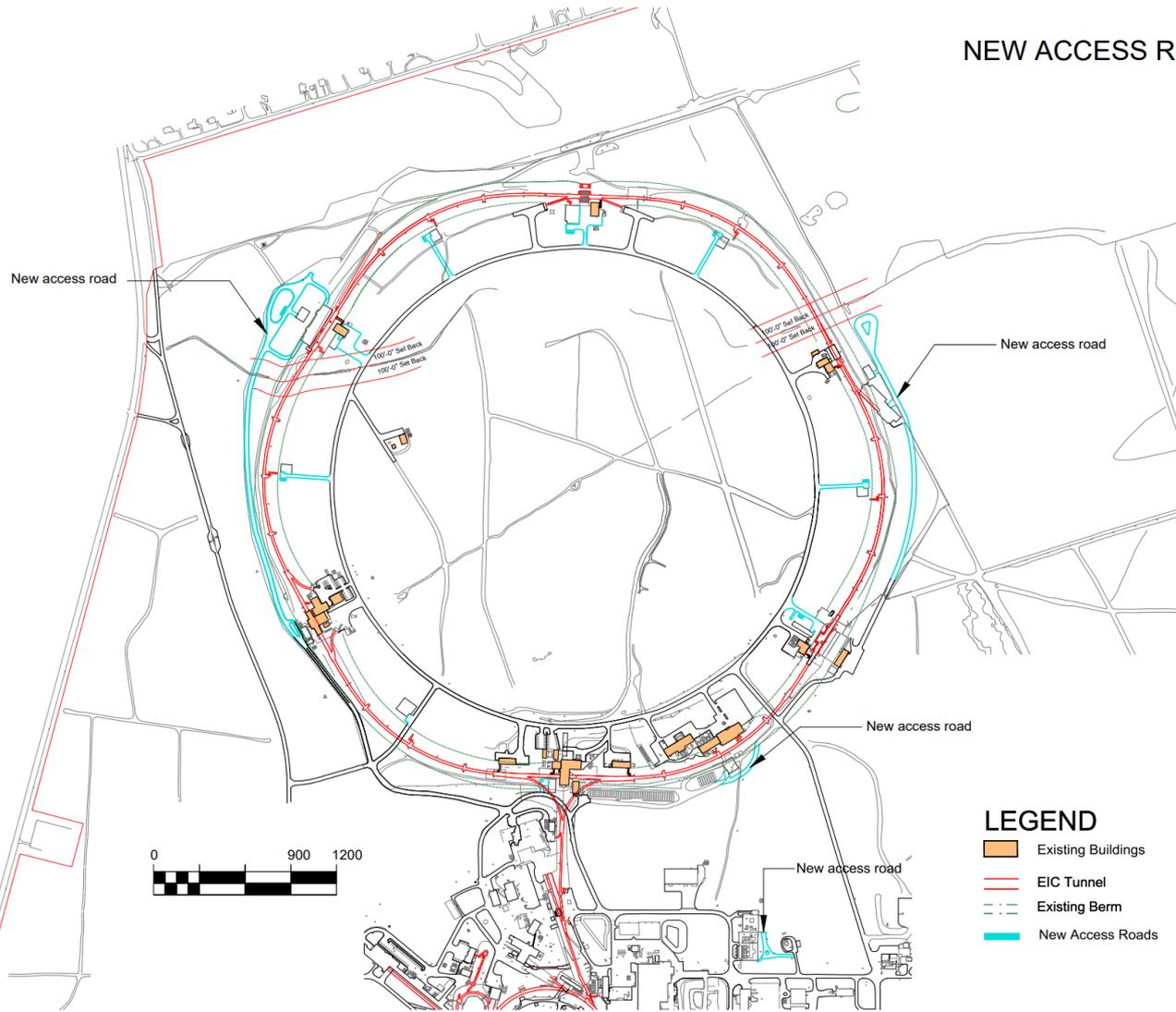
# Scope: Existing Site Plan

EXISTING RHIC SITE PLAN



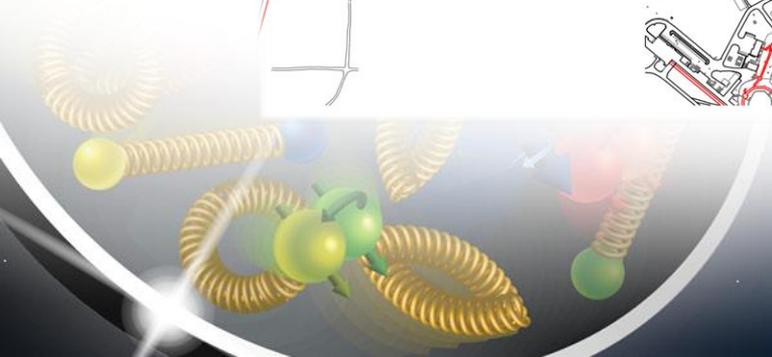
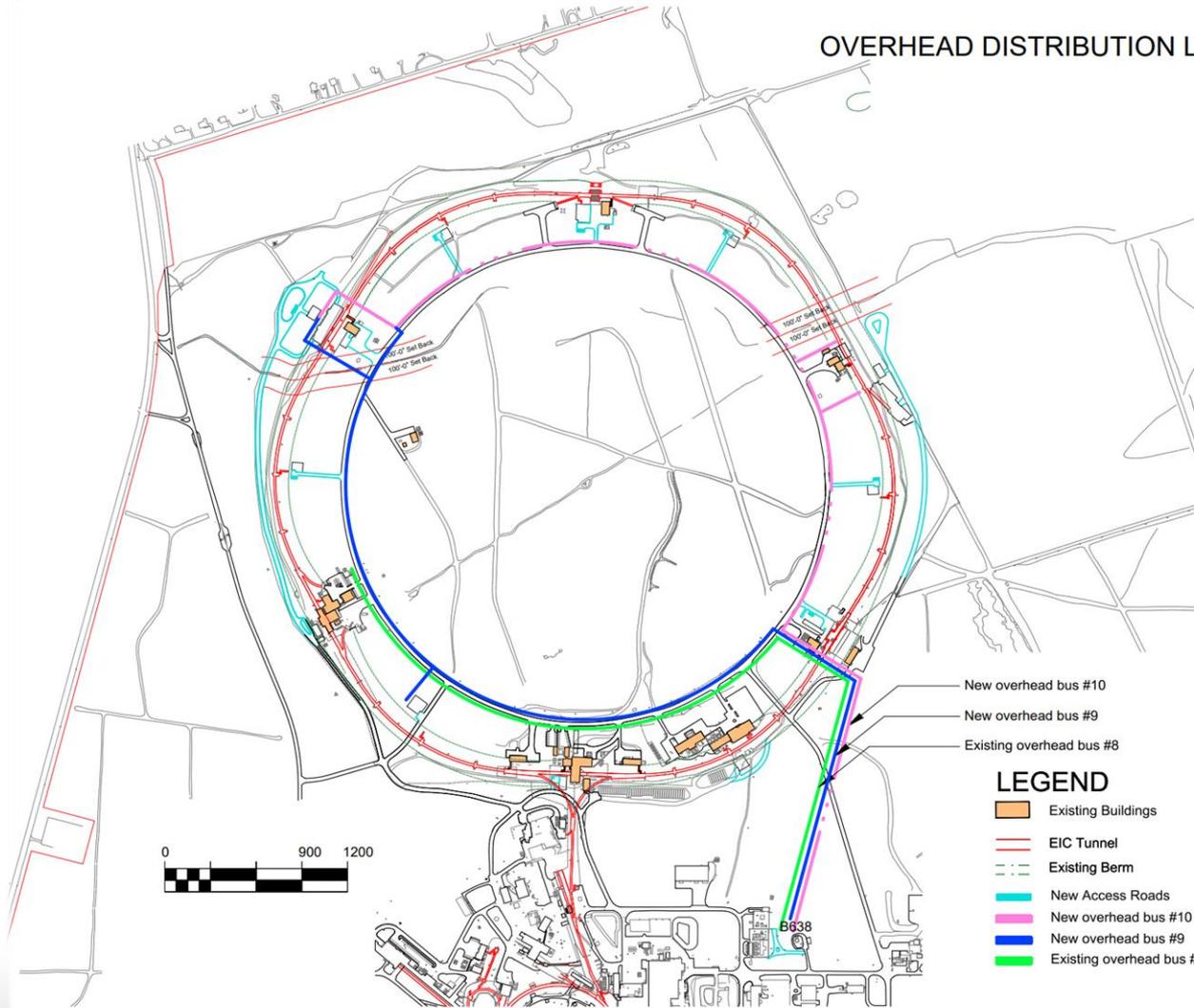
# EIC Proposed Site Plan: Roads

## NEW ACCESS ROADS



# EIC Proposed Site Plan: Power Distribution

## OVERHEAD DISTRIBUTION LAYOUT



# EIC Proposed Site Plan: Buildings

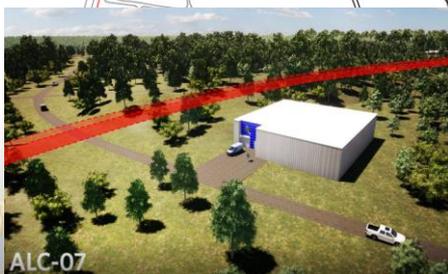
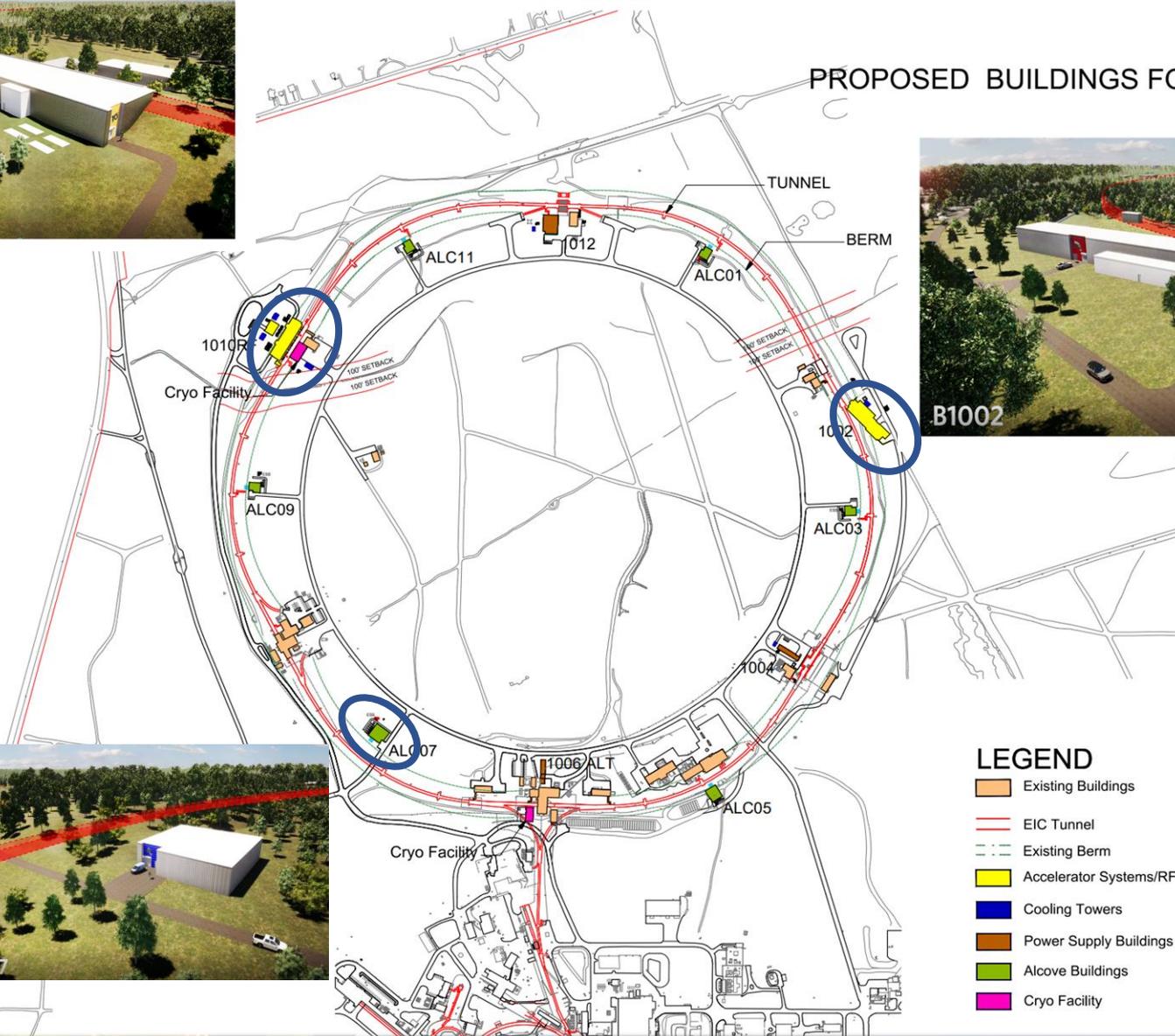


B1010

## PROPOSED BUILDINGS FOR EIC



B1002

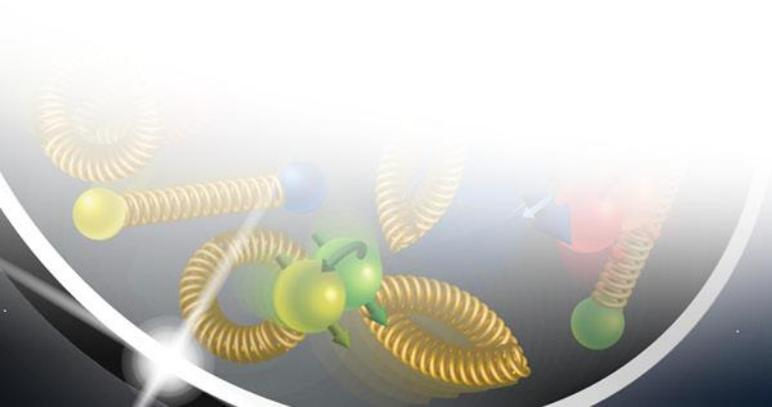
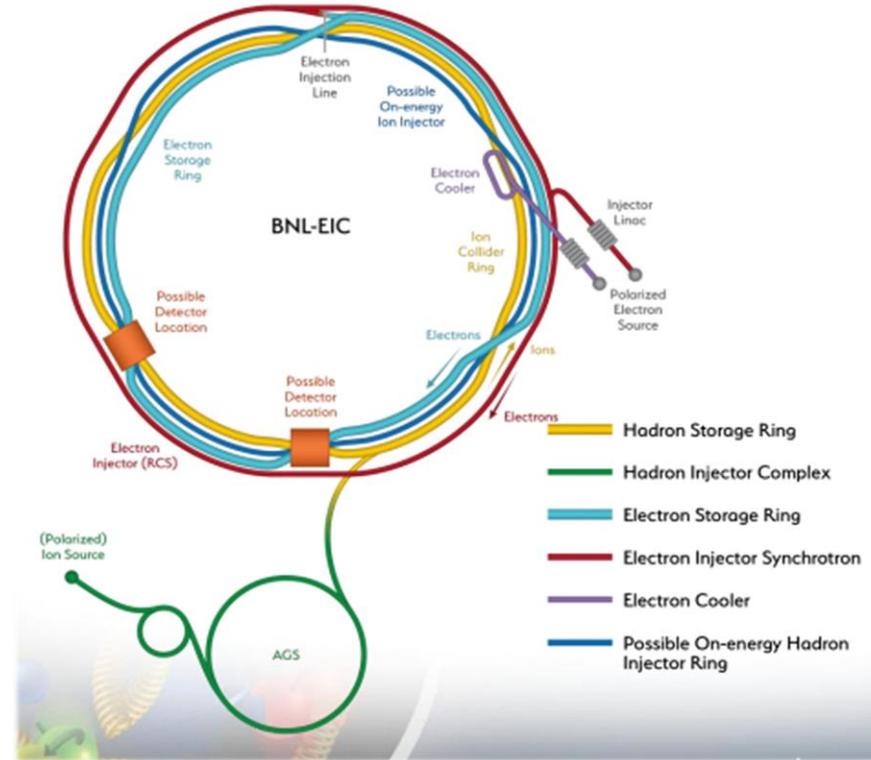
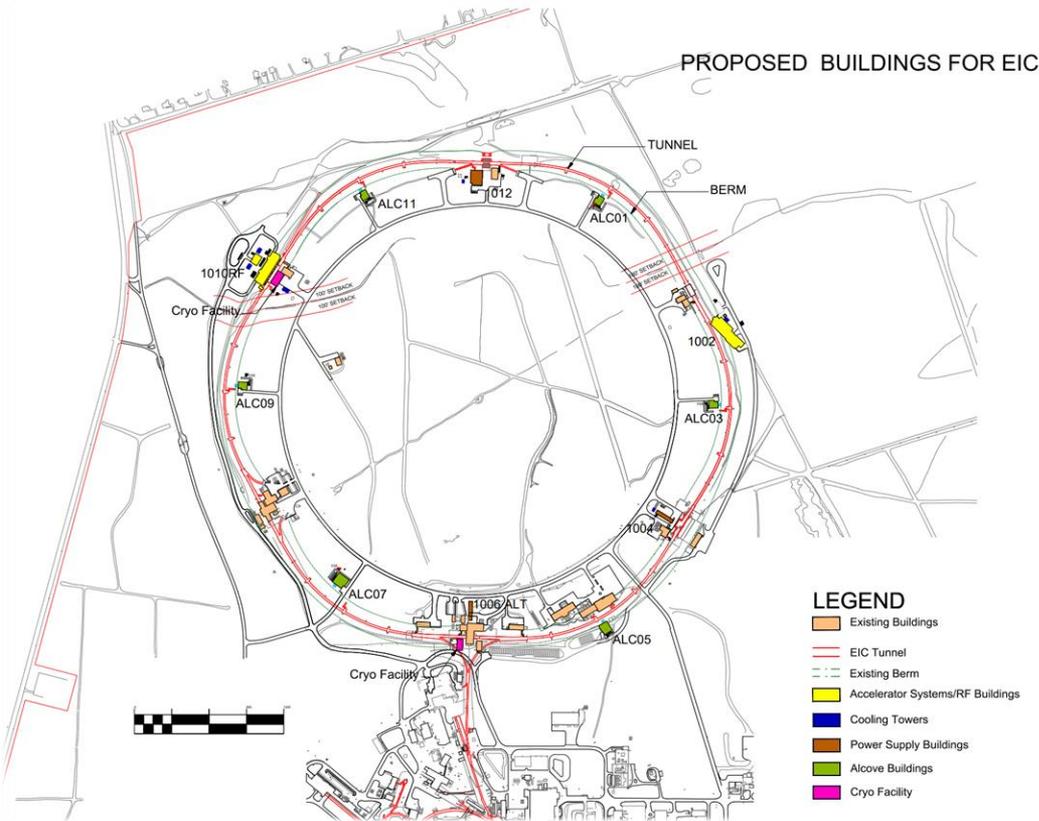


ALC-07

### LEGEND

- Existing Buildings
- EIC Tunnel
- Existing Berm
- Accelerator Systems/RF Buildings
- Cooling Towers
- Power Supply Buildings
- Alcove Buildings
- Cryo Facility

# EIC Proposed Site Plan: Building for Science



# Proposed Schedule

FY 2020

FY 2020

FY 2022

FY 2024

FY 2026

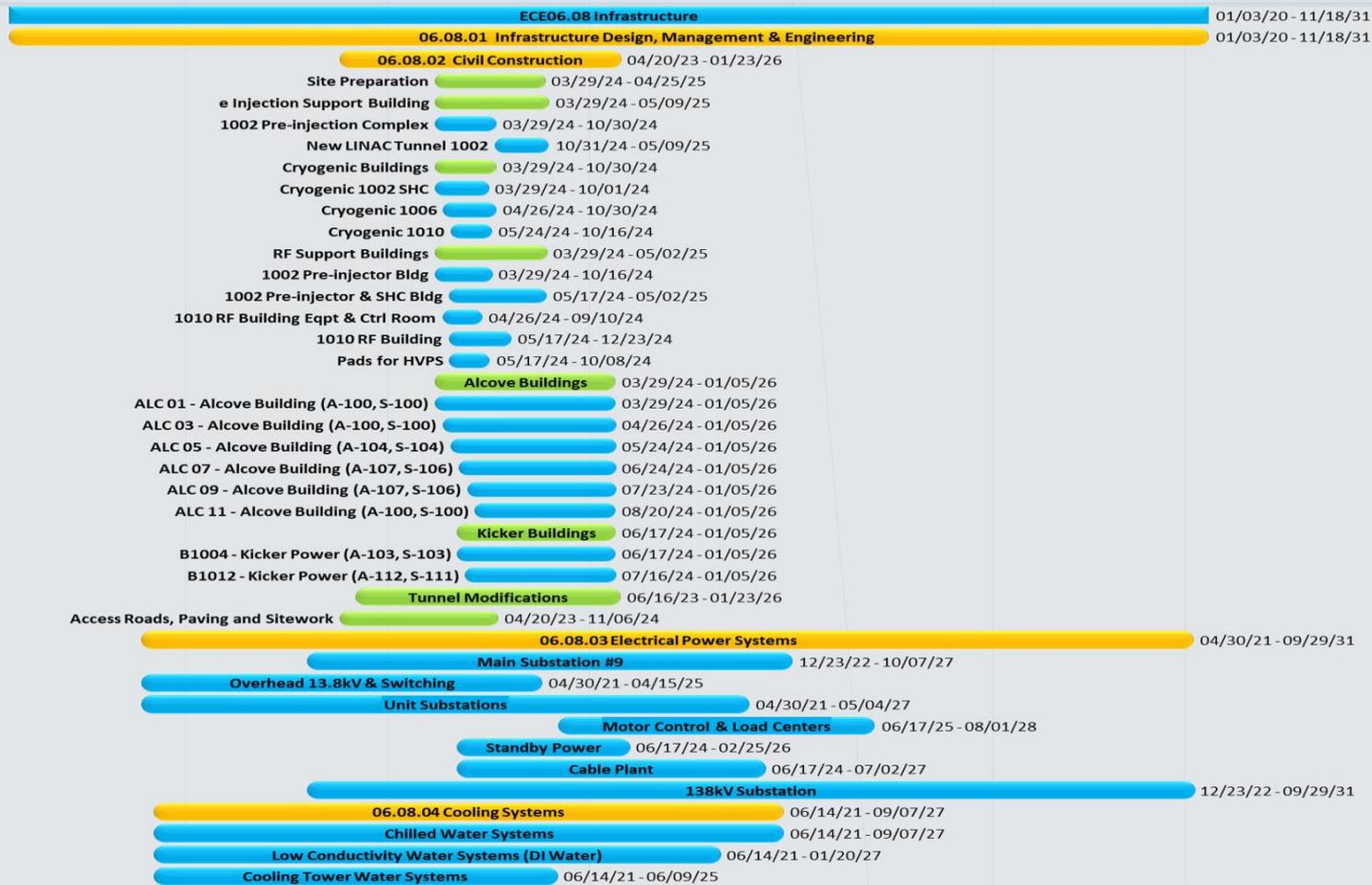
FY 2028

FY 2030

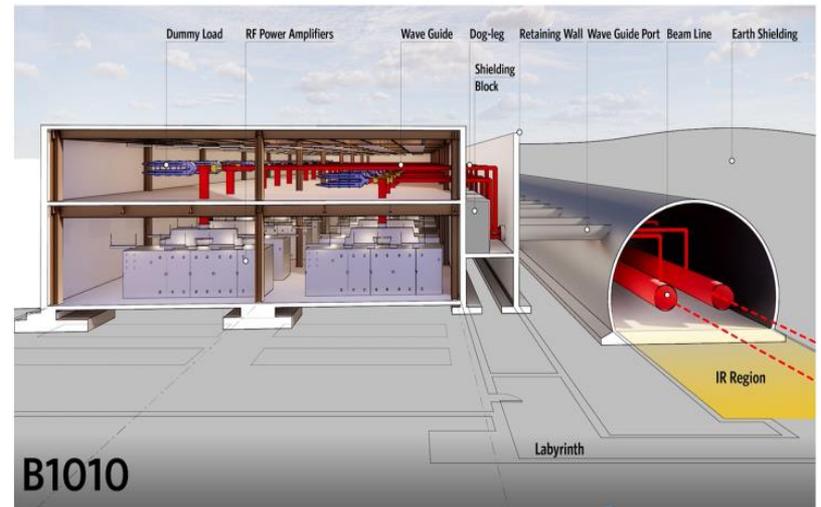
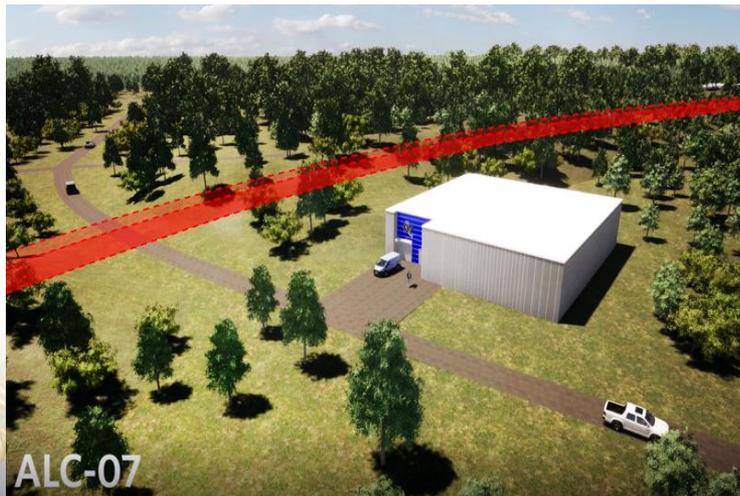
FY 2032

FY 2033

ECE06.08  
Infrastructure

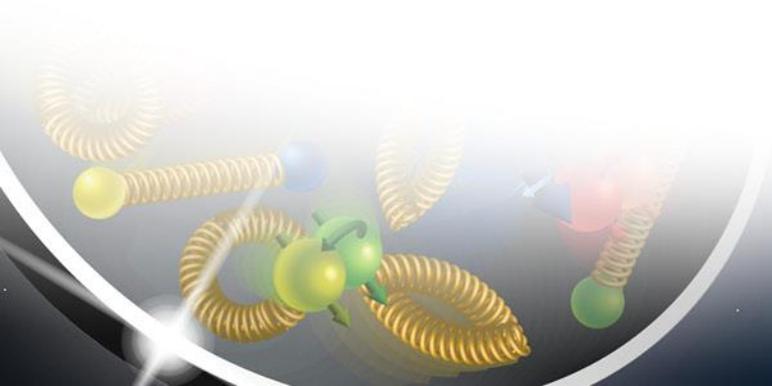


# Brookhaven National Laboratory – EIC Buildings



# Scope – Building Summary Table

Building	Designation	Quantity	Area	Total Area
Alcove Buildings	ALC-01, 03, 05, 11	4	2,330	9,320
Main Alcove Buildings	ALC-07, 09	2	4,820	9,640
Cryogenic Plants 1002, 1006	B1002C, B1006C	2	4,320	8,640
Cryogenic Plant 1010	B1010C	1	4,910	4,910
Kicker Power Supplies	B1004	1	4,480	4,480
Kicker Power Supplies	B1012	1	10,630	10,630
Electron Source Building	B1002	1	29,560	29,560
RF Building	B1010	1	42,130	42,130
<b>Total Gross Area</b>				<b>119,310</b>



# Construction Scope to be Funded by NYS

- We have received a commitment from NYS to fund \$100M of visible construction projects as part of the EIC
- We have identified \$100M of Conventional Construction Scope for this



# In Closing...

- Thank you for giving me this time and opportunity to present and discuss
- We are looking forward to planning and building the next generation collider right here at Brookhaven
  - We are also excited for the opportunities that will be available in building design, engineering and construction

